Developing values

TEACHING VALUES

ABSTRACT

This chapter explores the role and responsibility of teaching values through Design and Technology. It considers the values encountered through the authentic contexts and topical controversies in which Design and Technology learning tend to be located. Design and Technology education contributes to the development of young people's sensitivity to human and environmental concerns, both locally and globally. It can do much to encourage moral thinking and social responsibility in people, whether they are working as specialist technologists or thinking and acting as consumers, users or citizens. This chapter explores the influence designing and making, to meet needs, wants and desires, have on our environment, society, systems and ethics. It considers the way in which design activity not only reflects the values and beliefs of the community in which it is located, but shapes the values of the wider cultural context in which it is undertaken. The approaches to teaching and learning illustrated encourage pupils to recognise the interconnections of conflicting demands, constraints economic, aesthetic, political, environmental, ethical and moral, as well as ergonomic, technical and scientific values of designing and the consequences of the outcomes. The key intention is support teachers in embedding values based approaches into their own teaching and planning for Design and Technology learning.

TEACHING VALUES

INTRODUCTION

Where we teach, the philosophy and ethos of the school system in which we find ourselves, tends to be shaped by a statement of aims and values. Examining the values as stated in the aspirations of several countries from the UK and beyond highlights similarities. Curriculum frameworks and school policies often state the importance of working towards sustainable futures, social justice and equitable societies, and developing successful learners, effective contributors, responsible citizens and confident individuals. There seems to be some consensus that the values underpinning the systems and curriculum of schooling should relate to

- society, e.g. individuals capable of spiritual, moral, social, intellectual and physical growth and development, with consideration of community, culture and heritage, and respect for others;
- economic needs/development;
- the environment.

When values are proclaimed, as they are in schooling, they aim to indicate the national aspiration and purpose of education. This may be influenced by politics and ideology.

As a teacher of Design and Technology, your personal construct may include the understanding that Design and Technology is an intrinsic part of all cultures, past, present and future; that Design and Technology more generally addresses people's material needs and wants, such as food, clothing, shelter and health care; that it also contributes to the fulfilment of emotional, intellectual and spiritual needs and aspirations. Designing is often a social activity involving groups of people working as teams or in organisations, co-constructing a design idea, to arrive at an agreed resolution. The process of designing takes into account of a wide range of often conflicting demands and constraints and it is shaped by various positions and values - economic, aesthetic, political, ethical and environmental, as well as ergonomic, technical and scientific. Design and Technology activity is influenced by the values of the context in which it is undertaken and the people involved in the decision making. In turn, the results of the activity can influence behaviours and attitudes through its impact and consequence of its outcome, be it a product, system or environment. It is could be said that Design and Technology education involves the development of the skills to cope creatively with complexity, uncertainty controversy and compromise.

The role and responsibility of teaching values through Design and Technology is the focus of this chapter. Here, we begin to consider values in Design and Technology education, and the values encountered through the authentic contexts or topical controversies and issues in which Design and Technology projects and learning tend to be located. Design and Technology education contributes to the development of young people's sensitivity to human and environmental concerns, both locally and globally. It can do much to encourage moral thinking and social responsibility in people, whether

they are working as specialist technologists or thinking and acting as consumers, users or citizens. This chapter explores the influence designing and making, to meet needs, wants and desires, have on our environment, society, systems and ethics. It considers the way in which design activity not only reflects the values and beliefs of the community in which it is located, but shapes the values of the wider cultural context in which it is undertaken.

This chapter will prompt personal thinking and professional discussion related to values in Design and Technology. It is deliberately broad ranging, although certainly not intended as definitive and acknowledges the limitations of such a paper. It can only serve as an introductory illustration of the influences of values in design decisions and the importance of examining consequences and impacts of Design and Technology activity (of actions taken and of those proposed) on economies, environments, societies and ethics. It explores the opportunities through Design and Technology to encourage pupils to acknowledge their own value judgments and appreciate those of others and encourages you to understand your role as a teacher, in this regard.

OBJECTIVES

By the end of this chapter you should

- Appreciate the all-pervasive nature of the role of values and value judgments in the designed and technological world
- Understand the importance of values in the activities of Design and Technology
- Recognise issues, consequences and controversy in Design and Technology education
- consider how you will embed values education in your own teaching and planning for learning

TASK 1

Write a short paragraph outlining what you consider to be the value and purpose of Design and Technology education in the formal school sector. This should capture your personal construct and underpinning values for the argument for why Design and Technology should be in the school curriculum in the curriculum.

WHAT DO WE MEAN BY VALUES IN DESIGN AND TECHNOLOGY?

Values can be thought of as principles that guide behaviour, influence actions, shape attitudes and underpin, consciously or unconsciously our decision making. Values affect how we react and respond. Values-based education is framed in such as way so as to create a learner-centred approach, one which embeds values in the school

experience, planning, teaching and assessment. The principles of 'voice', engaged citizenship, articulated thoughtfulness and qualities of reflection, co-operation, and respect are considered to be aspects of a values-based education. Further reading will help you tease out differences between personal and professional values as related to craft of teaching and the professionalism of teachers. This chapter is not examining judgments as related to deciding on the approach to teaching and selecting specific content to teach, which is in itself a manifestation of personal values e.g. adopting a 'chalk and talk' or a collaborative activity, enquiry based approach. You may encounter a prescribed set of values such as tolerance, happiness, honesty, humility or particular religious or political values. Readings about values education literature may discuss approaches to enabling pupils to clarify and acquire their own set of personally meaningful values. However, this chapter is specifically exploring cognitive development and clarification of values through dilemmas and scenarios as encountered through design and technology. As such it will focus on ethical and moral values, and sustainability (i.e. social, environmental and economic) related values.

When principles and values are brought in bear in the context of Design and Technology, they begin to offer a framework for developing dispositions that are useful for evaluation and appraisal of existing systems, products and environments and for review and critique of new ideas as they are explored, and as proposed. Exploring the consequences of developments in technology is central to a values-based Design and Technology experience. The consequences of developments in technology are often unexpected and frequently have impact on a global scale. Design and Technology learning experiences should aim to encourage pupils to reflect critically and constructively on the interplay between technology, society, economy and the environment, now and in the past, locally, nationally and globally and in various cultural settings. For example, the introduction of, and continued advances and improvements in, digital communications are considered by some to have brought about adverse effects on the quality of social interactions, with face to face conversations and meetings being displaced by virtual and asynchronised exchange of information. Yet others argue the benefits of these technologies include those of bringing the older generation more frequently in touch with families living far away, combatting potential isolation and loneliness. Mobile technologies and ICT have influenced the systems and protocols of trade and transactions in many countries. For example, small scale farmers, coffee growing communities and artisan producers in many of the African countries have gained greater autonomy and control through direct negotiations with purchasers and consumers, and business transactions can be undertaken directly through the technologies of mobile money transfer systems of 'Tigo' or 'M-pesa' with no involvement of banks, traders and others to reduce the profit margins. Similarly, advances in educational resources and learning technologies, such the solar powered internet, are now available to schools which do not have landlines or electricity supplied through the grid. The mark of a 'successful' design, intervention, or technological advance may be open to discussion. The

discussion will vary dependent of the perspective and criteria against which it is to be judged. The identification of the criteria to be used will vary on the values underpinning the criteria. Some design solutions may be acceptable by some and unacceptable by others. There may 'winners' and 'losers'; the benefits for one group might be achieved at the expense of others. The existence of developments in technology may lead to technological and societal injustice and inequity between, and within, communities. For example, centuries ago aqueducts brought fresh clean water supplies to homes and yet in the twenty-first century millions of the world's population still do not have access to fresh and safe drinking water. There exists an obesity endemic, yet millions are starving or malnourished. These serve as examples of the value laden issues of design and technology.

When examined, most technological products are designed to offer comfort, convenience and advancement in quality of life for their users, but these very products can also have negative effects on human health, the physical environment and societal systems. This negative impact may not be noticed in the most immediate realm of the use of the product, nor by the users, yet it may be felt by the workers who manufactured the product, the environment from where the raw material resource was extracted, grown, processed. Every argument will probably be underpinned with value positions and depending on whose perspective, may be considered to have some validity.

TASK 2:
Practical Action is an international development organisation that believes in Technology Justice;

'Everyone has the right to access the technologies they need to live the life they value without limiting the ability of others now and in the future to do the same.'

What do you think it means?

THE INTERCONNECTED NATURE OF VALUES
Designerly thinking and technological capability encompass understandings of appropriate concepts and processes; the ability to apply knowledge and skills by thinking and acting confidently, imaginatively, creatively and *with sensitivity*; and the ability to evaluate technological activities, artefacts and systems *critically* and constructively. In order to be in a position to juggle all this, pupils need to be introduced to evaluation as a skill and disposition that includes a way of seeing and thinking about the world (past, present and future), of reflecting on the effects of human interaction with the environment and of thinking imaginatively about better ways of doing things. This requires a curious mind set and one which acknowledges the challenge of complex systems and engages in a thinking approach of cause and effect, considering the unexpected peripheral consequences or otherwise

interconnected loops and sub-systems. This requires identification of problems and issues and acknowledging the relational complexity of the made- and natural- world.

A values approach to Design and Technology enables the development of *technological sensitivity* (SCCC, 1996). Technological sensitivity has been described as one of a caring and responsible disposition, a habit of mind which asks and reflects on questions about social, moral, aesthetic and environmental values, as well as technical and economic values. Pupils need scaffolding in their Design and Technology experiences that allows them to appreciate that values may be influencing their own design decisions, and those of others, and that they can challenge actions and ideas. Design and Technology has the potential to help pupils recognise that there are various ways value judgements pervade technological activity. As a result of learning experiences in technology which are designed to develop technological sensitivity, pupils should be able to:

- appreciate that technological developments have consequences for people and the world in general
- apply considered moral and ethical judgements in evaluating technologies
- apply moral and ethical judgements to considering the effects that proposed solutions may have on the well-being of individuals, societies and the local or global environment.

Reflection on issues that bear on a particular technological task needs to be connected with taking practical steps to develop design proposals into prototypes, products, systems and environments, integrating technical considerations with social and ethical considerations. Likewise, pupils need to gain insight into how, in the various roles people play as producers, service providers, consumers and citizens, it is possible to participate in technological activity with confidence and a sense of responsibility. Pupils can be supported in ways in which they can speculate about, and consider critically, possible future developments in and impacts of technology, not least in relation to local and national economies, the ethics of such development, and the quality of people's lives. Pupils can be introduced to this at an early stage through a simplified cause and effect model of decision making. Through a coherent progressive approach to values-based Design and Technology the pupils should be given opportunities to develop skills to cope with increased complexity, compromises and multiple perspectives. The next section begins to explore potential teaching strategies with this in mind.

TEACHING APPROACHES TO ENGAGE PUPILS WITH VALUES

This section begins to explore teaching approaches which aim to examine and embed values in Design and Technology learning. Common to all of the strategies below is the explicit recognition of value judgements and inherent values of the context under scrutiny, the product being evaluated, the design brief that stimulates the designing activity; the materials and processes reviewed, the issue being debated, the case study

analysed and so on. The role of authenticity has been noted elsewhere and is an important tenet of any Design and Technology learning experience. Characteristics of effective Design and Technology education include authentic and meaningful contexts which are introduced to the pupils with the intention of the pupils addressing a design brief, engaging in debate or seeking opportunities for design related activity. Choices are being made regarding the meaning and the actions taken from this authentic context. Design and Technology is reliant on decision making and through this decision making the importance of value judgments are brought to bear, those of the individual and those framed by the societal context. Pupils need to know what principles influence their own values and those of others and therefore what is driving their decision-making, and their question-asking. This in turn may reveal further authenticity as related to the context in which the design thinking is set**.**

A values approach to Design and Technology education involves scrutiny of what is considered as technological progress and review of the benefits such advancement is thought to have. This may be approached through 'technological developments in society' case studies; or innovation and engineering timelines, introduced to pupils as illustrations of how technologies can reduce the heavy burden of physical labour, improve standards of living, provide access to education, improves ways of coping with illness and disability and generate wealth which can lead to prosperity for many people. The same timelines and case studies can also be used to introduce pupils to the increase in social and economic inequity and technological injustice, exploitation of communities and resources, contribution to ill-health through pollution, contamination and poor working condition, abuse of indigenous cultures and traditions; a story told from different sides. Multiple perspectives and a variety of lens are required to introduce your pupils to the non- neutrality of technologies.

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For values to be explored in Design and Technology, a teacher needs to draw from a broad repertoire of strategies. Some strategies may be very specific and focussed directly in association with a specific design and manufacture type of Design and Technology activity, some may be product evaluation and exploratory case study approaches to illustrate the range of perspectives to consider in universal design thinking, with the specific intention of raising awareness of the importance of values in Design and Technology more generally, and explore the influence they have. Other teaching strategies may seek to develop greater appreciation of the indigenous and appropriate technologies from cultures other than the one in which the pupils are from. There may be projects devised to examine consequences (intended and otherwise) of intervention through design and technological activity through 'body storming' and user trip techniques that provide insights 'through the lens of others'.

Teaching and learning strategies include:

- Reframing 'problems' and 'problem setting', systems thinking
- Newspaper reports and media reporting – behind the headlines
- 'Global Story lines' dilemmas and scenarios

- Alternative lens - role play, controversies and debates
- Practical Action tasks- e.g. Let's Negotiate, Technology Justice game
- Reading products and environments as texts
- Case studies, time lines, line-ups
- Future gazing/ fore-sighting alternative models

A few of these strategies are expanded upon to illustrate their potential contribution.

REFRAMING 'PROBLEMS' AND SYSTEMS THINKING

The way you frame your teaching and how it is presented to your pupils can help them to understand the values inherent in all designs and technologies. The pupils, with your support, will begin to appreciate the nature of the interconnections between actions, decisions, values and outcomes. The language and terms you adopt can convey implicit messages and values. For example, the term 'problem solving' implies a technical fix is suitable to address and solve the problem, as it is presented, as an unambiguous given. In turn, a technical fix implies that the criteria which will be used to judge of success of the 'solution' will be based on technical values. If the solution which solves the problem as it is framed/ presented is considered to be 'fit for purpose', worthwhile and successful in technical terms only, then this raises concerns that perhaps other values are not embedded in the criteria against which the problem solving is judged. Who decides it is a problem worth solving, using what criteria and from whose perspective? Conway (1994:113) suggests that a more useful phrase is that of a 'problem centred' approach. This frames problems as 'complex situations requiring sensitivity, wide sympathies and the need to judge between conflicting values' when seeking to address them and arrive at an appropriate resolution. To illustrate (figure 1), compare the first six examples using a basic 'problem solving ' and 'solution finding' approach, with the of the lower three examples of 'problem centred' approach. The problem centred approach requires a reframing through further questioning to interrogate the problem more deeply. Sterling (2005), in his work on 'Linking Thinking' and Schon (1988) discuss the importance of 'reframing' further. Schon emphasises the importance of 'problem setting' which he describes as the process of defining the decisions and choices to be made from the messiness and uncertainty of the problematic situation; reframing the problem and its context. His concern is that the term 'problem solving' neglects the importance of considering the values that influence decisions and choices and designerly thinking.

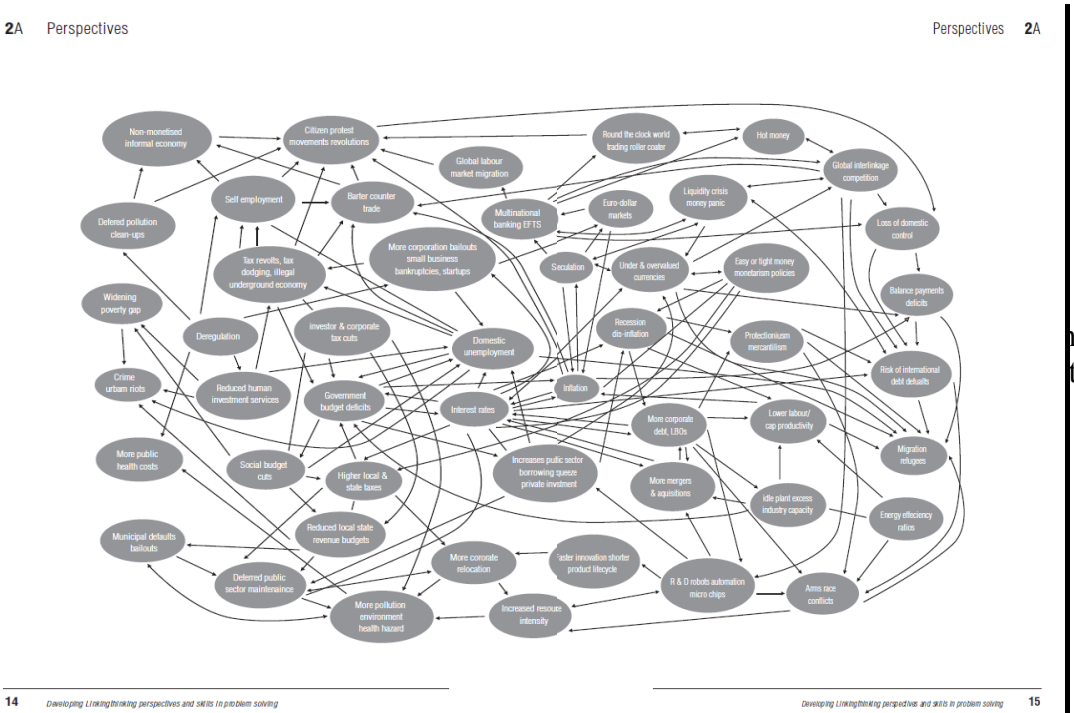
Problem stated	Simple solution to problem	
You have an infection	Take antibiotics	
There is an increase in crime in the area	Put more police on the beat	
There are more traffic jams than there used to be.	Build more roads	
There are low agricultural yields	Use more pesticides and fertilisers	
There is increasing amount of waste being collected	Dig bigger holes to put it in	

There is evidence of global warming	Plant more trees	
Question framed problem	Ask more questions	Reframe the 'problem'
Are you feeling cold in the house?	Why are you cold?	Maybe there is a problem with the insulation rather than the heating? Maybe your overall health and circulation is the root issue?
Are too many cars on the road causing congestion?	Why are there too many cars on the road?	Is there something wrong with public transport? Or have we designed things so that people have to travel more?
Are more young people engaged in underage drinking?	Why do these young people feel the need to drink?	Is it linked to youth culture? Is there a lack of alternative facilities or things to do? Is it linked to advertising or celebrity lifestyles?

Figure 1. Illustration of problem-solution approach and question-framed approach

Stephen Sterling's Linking Thinking (2005) suggests that simple problem solving and a problem solution approach often raises four issues:

- the solution tends to address the symptoms but not the underlying causes
- the solution can sometimes give rise to further problems
- the nature of the problem itself is not questioned or seen in a larger context
- the interaction of complex factors which may give rise to the problem tends to be overlooked; interconnections tend to be neglected (see web diagram 2) which illustrates holistic, interconnected systems thinking - this begins to reframe and interrogate issues, scenarios and context, values are implicit in the influences and consequences of each and cannot be separated from the connections.)



TASK 3 Relational Thinking
For each of the technical/technological products listed below, adopt a systems thinking, relational approach and identify the benefits and drawbacks of each product. Think of the immediate uses and users but also think beyond to the consequences for society, behaviours, health and well-being, peripheral business and industries, integral sub-systems, land use, employment, economies, environment, morals and ethics of decisions related to individuals use and uses and corporate, commercial, local and global implications, and outcomes.

Consequences of common technological products

- Microwave
- Automobiles
- Aeroplanes
- Mobile phones
- Internet access

BEHIND THE HEADLINES
Creative teaching strategies can be developed to engage pupils in controversial and / or topical issues related to design, engineering and technology, either in their local environment or further afield. Newspapers, news reports, magazine articles and media coverage provide useful authentic starting points for activity. Pupils can be asked to extract information, declarations from different perspectives, e.g. local media coverage of the proponents of wind farms or fracking from the view of protesters and supporters, and to research the topic to ascertain the validity of the coverage.

Alternatively, pupils could be asked to write a critical review from the breaking news or marketing of new products and technologies and the promises they offer, e.g. piezo-electric dance floor technologies which have been promoted as sustainable dance floors in nightclubs, since 2008. How do they work? Who benefits? Why were they developed? What is the impact of their existence? What are the values underpinning the design, installation and use of such an innovation? You may wish to select some newspaper articles for stimulus or to focus of specific categories and topics. Alternatively the sourcing of the initial story could be part of the activity. Depending on the age and ability of the pupils you may need to suggest questions and provide prompts, or a writing-frame, to help them to structure their review.

You could also build on ideas and resources which have already been developed to involve pupils in considering natural disasters, emergency and resilience planning. The pupils could explore a broad range of perspectives on the impact and consequences when designing of systems, environments and products associated with these scenarios. The teaching can focus on a wide variety of pre-emptive and/ or post-disaster engineering, land use, architecture, shelter, transport, food, water and basic

survival, communication and so on. Each decision and action will have a reaction or further consequence; interconnections can be sought between people, place and intervention, innovation or imposition. This opens debate, discussion and demands closer examination of criteria which is developed, not only through empathetic reasoning, but also value judgments and choices related to technical, environment, society, culture, economy and ethics. 'Global Storylines' is just such an approach (http://www.globalstorylines.org.uk/about).

GLOBAL STORY LINES DILEMMAS AND SCENARIOS

'Global Storylines' combines traditional interdisciplinary methods of 'Storyline', with values-based research, process drama and deep reflection. Global Storylines take a planned approach which is choreographed by the teacher and incorporates very specific learning as identified in the curriculum framework of expressive arts, science, technologies and social sciences. The storyline develops through an inter-disciplinary learning approach and immerses the pupils, who 'become' characters within a community affected by a particular global issue, in contexts of topical controversy, and values are explored first-hand as the pupils undertake research and tackle the issues presented by assuming various roles, stakeholders and engage in decision making and debates. Global Storylines may take on contexts such as water systems and supplies, extraction and processing of minerals, ores and materials, enterprise, trade and commerce. The result is that technological developments in society, from the global to the local, can be examined through a range of perspectives and associated values which are considered, informed and made explicit through the process.

ALTERNATIVE LENS

'Alternative lens', role play and debates have some similarities with the approach of 'Global Storylines'. The role play could be a formal debate, a courtroom or public discussion, a television-type discussion. The skills of researching and developing some working understanding of the topic and knowledge underpinning the issues are important as this helps to avoid engagement in the learning from a wholly emotive and emotional response. Without preparation, your pupils may react at a subjective and highly personal, emotional level. Even then, it may not be a reaction provoked by their own values; it may be modelled from others, or influenced by media, or they may espouse opinions garnered from the home environment. Although personal and emotional value judgments are valid, it is important for pupils to learn why they have come to hold the values the do and what has influenced them. They may develop informed attitudes and their values may alter when they are furnished with a deeper understanding and have been permitted time to reflect, critique and be made aware of the values of others. 'The Great Energy' debates, NIMBY('Not in my back yard'), IMBY ('In my back yard'), are useful strategies which, for example, require technical and technological understanding of function, scale, processes, systems, materials, infra-structure and peripherals related to whatever the debate is about, prior

to the debate beginning. The debates then encourages space be given to the voice of the various citizens and stakeholders generally for the arguments to be made.
Some points for consideration when setting up teaching of this kind, you will need to:

- prepare the pupils by providing starting materials and time for them to research and investigate
- allocate roles carefully
- consider how best to group the pupils
- establish 'rules' and protocols for the debate or discussion.

Following the role play you will also need to allow time for discussion – how did the pupils feel playing the different roles, what did they learn from the experience, how can they use this learning?

NEGOTIATION OF DESIGN SPECIFICATION

When a design specification is created, who decides on the criteria that act as the initial framing of the design thinking? The design specification initiates analysis which prompts the direction of further research and, as a consequence, frames evaluation. It can be an influential aspect of designing. Who makes the choices of what is deemed suitable in the first instance to initiate the design activity? If an evaluation is reduced to 'does the product meet the specification?' then the evaluation may well consider fitness for purpose, as declared by the specification, and take a technical and perhaps aesthetic value base to make judgments regarding the success for the outcome. But where are the prompts to ask about the values that discriminate between fitness for purpose and if this a desirable product in the first place? Whose values are making the decision that such a product should exist? Who is asking, 'What is the result of bringing this product into being?' A values-based Design and Technology encourages pupils to ask who decides what is worthwhile and based on what criteria. With these questions Design and Technology enters the arena of ethical and moral values.

Among the many activities available from the organisation Practical Action (http://practicalaction.org/schools), is 'Let's Negotiate' which requires pupils to negotiate in a group to arrive at a specification for a design activity, through conflict, debate and compromise. Working in groups, pupils decide what takes high, medium and low priority in deriving the specification, and there is a limit on how many criteria can be in each priority section. If one group member intends to move or add a statement from one of the priority categories to another and/or replace one statement with an alternative, a full justification has to be argued and negotiated with the other group members. This approach draws on value-education research which examines the role of confrontation and argument in the clarification of values, through moral dilemmas. The dialogue and debate which explores moral reasoning or opposing moral solutions facilitates interpretation of the identified values between those involved in the discussion; conflict acts, in such cases, can act as an agent of moral growth.
'Let's Negotiate' activity incorporates statements which present implicit, and explicit, values related to technical, aesthetic, ethic, environment and economic criteria with

which the participants compile a specification. The statements include, 'minimises energy use in production'; 'workers have fair pay and equal rights'; 'must not produce any hazardous waste'; 'promotes a happy, healthy life; made from local materials'; 'capable of being repaired'.

DESIGN OUTCOMES AS GENRE OF TEXTS

It is possible to encourage pupils to 'read' products in order to uncover the values embedded within them through evaluation activities. A product or environment can be analysed in much the same way as text to uncover meaning. Access to the conceptual insights of the designer in the process of designing the product is not usually possible. The design decisions may not be explicitly shared with the user by the designer or manufacturer, yet appraisal of function, target users/ consumers, style, shape, form, proportion, materials, processes, manufacture can reveal some back-stories of the value judgments that are embedded in the product and the decisions and choices that led to the final product. These may have been shaped by the values of the client and / or the designer, or indeed the many stakeholders involved in the process. Although the evaluator, in this case the pupil, may not be privy to the ideology, there may be values which the pupils 'see' in the products which the designer never intended, or considered. The pupils can begin to hypothesise and tease out some implications and effects on society caused by existence of the product.

McLaren (1997) and others have discussed the prompts with which teachers can facilitate the process of evaluation and enable pupils to explore and reflect on the consequences of the actions of other designers and of their own. For example:

- How necessary is this product? Who has decided it is needed?
- What is the need that is being addressed? How was it addressed in the past?
- Who would want to own or buy this product? Who do you think it is intended for?
- How universal is it in its design? e.g. for younger or older users, those with limited faculties etc.
- How is it to be used? What alternative uses could it be put to?
- What effect will it have on people's lives and relationships?
- What effect will it have on the built and natural environment?
- What will happen to it after its use?
- What factors lengthen/limit its life-span?
- Is there an alternative method of achieving the same function?

The pupils can be asked to define 'value for money'- an oft used phrase in making a decision to purchase or heard as an endorsement. What is the true cost, for example when taking account of the source material, processing, manufacture, transportation, carbon emissions and lifecycle analysis costs and effectiveness in relationship to environmental and social impact? Investigations and evaluations could explore beyond the materials and manufacturing processes to include the consequences of using a specific resource in a particular way and the impact this has on both users and workers. Evaluating the relationships between the supposed target user group and those

involved at each stage of the design and manufacture through to marketing can provide greater understanding about those who are indirectly affected by design decisions or by-products of the manufacturing process. Values can also be explored when time and thought is given to consider the potential of uses for a product beyond the intended use. This has the potential to reveal unintended tertiary uses, potential liabilities or unexpected risks. For example, the innovation of a single user power chain-saw permits small-holders to maintain good stewardship of their woodland and contribute towards a more sustainable local timber source. Alternatively, the existence of such a chainsaw may facilitate illegal logging of timber. Other design outcomes which offer rich picking for 'reading' may be out-of town-shopping malls, the siting of by-pass road carriageways, positioning of elevators, escalators and stairs in hotel design. Within each scenario, there are questions and values to explore, not only technical and aesthetic, but those of economy, society, environment and ethics.

ISSUE-CENTRED CONTEXTS

Teaching Design and Technology, by its very nature, relates closely to contexts of enterprise, citizenship and commerce and links to topics such as fair trade, employment, manufacturing and production systems, social enterprise or not for profit, or cooperative schemes, and for-profit investments trade and commerce systems. Design and Technology learning experiences can be presented in various forms to simulate the various approaches, to develop the knowledge and skills to examine the consequence of each as an issue-centred context and discuss underlying ethical and moral considerations of each.

Planning and teaching Design and Technology from a value based construct does much to ensure learning does not only revolve around a design and make paradigm but also begins to examine the role of Design and Technology in society, systems and infrastructures, and industrial and commercial practices (e.g. health-care, waste disposal and treatment, water-purification and supply, agriculture, food production and processing, tourism, biodiversity and environmental management, energy and power generation, etc.). Teaching about values and ethics in Design and Technology can draw on examples from the past and the present and offers opportunities for some fore-sighting, using known disruptive technologies (see Chapter x) as a stimulus to project and model different futures. This promotes a way of thinking that is beyond the technical and aesthetic values, albeit they too may be implicit, and encourages the pupils to ask the questions 'why?', and 'with what results?' The designer, engineer, producer, marketer, policy makers, governments, and consumer take some responsibility for innovation, intervention and evolution resulting from the act of designing and making and therefore also any manifestation of consequences.

Values related learning can be directly related to everyday aspects such as food, examined through issues related to seasonality, production, employment, food miles, economy and trade, health and food security. There are some controversial and

dilemma-based opportunities for teaching about these values, for example using 'lines-ups' to explore the initial attitudes and values of pupils. These activities present pupils with a statement and ask them to stand or line up in a position that represents their agreement with the statement, from 'strongly agree' at one end to 'strongly disagree' at the opposite end. Pupils then discuss and position themselves accordingly, and discussions can follow on why they believe as they do, what has influenced this personally held value. Example statements could include:

- we should only eat food grown within our own country
- eating food that is grown out of its natural growing season should be banned
- I would not eat banana/chocolate unless it was labelled as fair trade
- palm oil is a sustainable crop and should be used in more food stuff.

After the initial activity, pupils undertake investigation and research using various sources, reports and stakeholders views, and then the exercise of 'line ups' is undertaken again. Any shift is explored and justified from a position of the increase level of awareness.

The introduction of changes in industrial and commercial practice, new and/or different technologies and systems, changes in suppliers, revision of raw material stock and procurement decisions regarding provenance and eco-assurances, and so on will have consequences and impact on labour, skills, quality of lives, profits, carbon levy, waste-disposal taxes etc. Explicitly extending this awareness of the values underpinning operational decisions in production systems such as 3D printing and CAD/CAM generally, material choices, (e.g. hardwood, softwood, MDF, acrylic, ABS, PLA) and procurement, local seasonal food, fair trade cotton, to school workshop practices can serve to model the complexity of the context in which many societies operate.

TASK 4

Devise an activity for pupils to investigate relational thinking and values involved in a product that you might teach about, for example fashion items, which are readily available in the high street stores at very low retail prices and sometimes described as throwaway/one wear' items (or an equivalent product type).
Write four statements for use in a 'belief circle' which begin to explore attitudes towards the product. Source a newspaper story, magazine article or internet site which covers conditions of employment and manufacture of examples of the product. Consider what would constitute a useful handling collection for this activity, e.g. garments with labels stating material, country origin for garment (or for the equivalent product). Would your planning consider contrasting low quality items with 'branded' products?

FUTURE GAZING: ALTERNATIVE MODELS

The contribution of Design and Technology to the Education for Sustainable Development (ESD) agenda can be a powerful driver for design thinking and activity

through the key aspects of the evolving nature of the concept of sustainability, namely the environment, society and economy. Included in the characteristics of ESD, as described by UNESCO (2005) is the empowerment of communities towards development that is locally relevant, culturally appropriate and based on local needs, perceptions and conditions, whilst also acknowledging that fulfilling local needs often has international effects and consequences. As such, engaging in sustainable designing offers a great many opportunities to engage the pupils in values-based learning. There are many teaching and learning resources available from which, with careful review, you will be able to select the most appropriate to your needs, adopt as is, or adapt to suit. Designing with sustainability in mind may involve reviewing technological developments and changes over time in the way we live, behave, eat, communicate, travel, etc. For example in the UK, from having few personal belongings, through the post-war make-do-repair years to a mass consumerism materialistic society, and perhaps to the realisation that things need to change for the health of the planet and all its inhabitants. The key messages tend to be related to the way in which we, in the so called 'developed world' and increasingly in the 'developing world', are using an unsustainable amount of 'stuff', using finite materials to produce this stuff and generally living beyond the means of the one planet we rely upon on.

Your teaching can incorporate alternative models of thinking for design, engineering and technology decisions including the principles of a circular economy (See Ellen McArthur Foundation http://www.ellenmacarthurfoundation.org/). The circular economy rethinks the traditional, industrial, linear model of 'take-make-dump' and develops an alternative closed loop systems thinking model which emphasises material cascade, zero waste, waste is food (as in any biological system of nature), energy from renewable sources, design for disassembly and repurposing (biological and technical components and materials in distinct cycles) and many other rethink, redesign, cradle to cradle approaches, including challenging the concept of personal ownership.

TASK5 Values in the Design and Technology Curriculum:
Look through the Design and Technology curriculum guidelines or frameworks that apply where you are and identify where there is reference to values of society, environment, economy, sustainability, ethics and morals, cultures and heritage. Think about how you would incorporate these values in your plans for teaching. What strategies would be suitable to engage the learners with these values?

MANAGING ACTIVITIES
Planning, teaching and management of values based learning activities require care and sensitivity. The 'rules of engagement' must be communicated clearly and all participants must be helped to understand that an environment of mutual tolerance, inclusiveness and respect is important to allow everyone to discuss, express their

evolving thoughts, voice opinions, and ask questions to explore their own values and those of others. There needs to be a supportive context established where moral reasoning is encouraged. This can be scaffold by open questioning, non-judgmental scrutiny and prompting. Inevitably, controversial issues and conflicting opinions will be voiced by the pupils and there may be moments of tension when familial values are in conflict with values explored and 'voiced' in classrooms. However, the activities illustrated in this chapter adopt strategies which are devised specifically to explore values through clarification and reasoning. They offer a cognitive developmental approach, personal to each pupil, and enable pupils to acquire an understanding of values through independent, sensitive thought.

CONCLUSION

As you develop your own understanding of the role of values in the world of design and technology you will also develop your repertoire of teaching strategies which enable the pupils to examine and develop an increased awareness of values in Design and Technology, without you feeling uncomfortable or that you are preaching your own values. You will begin to recognise potential contexts, resources and stimuli more readily – although it will be important that you read widely and keep up to date with technical and technological developments - and incorporate these in your planning and teaching. In addition to the wealth of inter-disciplinary learning opportunities possible in school, you may also find it useful to develop partnerships with education officers and experts from non-governmental organisations (NGOs) and other agencies, to support you with international and local issue and values based learning.

The processes and products of Design and Technology have profound effects, beneficial and otherwise, on the quality of people's lives and their environment. This in itself seems to provide sufficient justification for including significant opportunities for technological learning in the general education of all young people. However, technological learning by itself is not enough; pupils will be better equipped to live purposefully, productively, confidently and wisely in the world of today and tomorrow if they have been enabled to acquire and deploy a broadly based technological capability, which incorporates technological sensitivity and the critical skills this involves. This capability can be developed if pupils are helped to recognise that values underpin decisions and choices in all we say and do. Indeed, many values are implicit, remaining under the surface never to be discussed to any great extent, if at all. Therefore, the ambiguity of design should encourage us to evaluate from a number of perspectives and against a wide range of criteria, which includes value judgements. Teaching values may encourage pupils to look beyond the surface, peel back the skin, examine the way in which things are produced, ask not only the how, but the why and what is involved in the manifestation of ideas, seek to enquire if respect and fairness is present at all stages and phases from inception to realisation, in use and after use. Appreciating that there are always consequences and impacts, implicit and explicit

values may help pupils to make considered and informed decisions as technological literate citizens.

REFERENCES

Conway, R. (1994) Values in Design and Technology Education', *International Journal of Technology and Design Education* **4**, 109–116.

Ellen McArthur Foundation http://www.ellenmacarthurfoundation.org

McLaren S.V. (1997) Value Judgements: Evaluating Design *International Journal of Technology and Design Education* 7: 259–278,

Scottish CCC (1996) *Technology Education in Scottish Schools; A statement of Position* Dundee: Scottish Consultative Council of the Curriculum

Schön, D.A. (1988) Designing: rules, types and worlds. *Design Studies, 9*(3), 181-190
Steven Sterling et al (2005) Linking Thinking WWF available from www.eauc.org.uk/file_uploads/**linkingthinking**-302.pd

Practical Action website http://practicalaction.org
UNESCO Education for Sustainable Development (2005) http://www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/publications/

FURTHER READING

McDonough, W. and Braungart, M. (2002) *Cradle to Cradle: Remaking the Way We Make Things* North Point Press

McLaren S.V. (2012) Considering Some Big Issues and the Role of Technology Education in Transformational Change in P. John Williams (Ed.) *Technology Education for Teachers* Sense Publishers 231-260

Middleton, H. (2005) Creative Thinking: Values and Technology Education *International Journal of Technology and Design Education* 15:61-71